DOCUMENT RESUME

ED 316 561 TM 014 511

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TITLE The 16PF Tradition in Contemporary Personality Assessment.
PUB DATE Aug 89
NOTE 11p.; Paper presented at the Annual Meeting of the American Psychological Association (97th, New Orleans, LA, August 11-15, 1989).
PUB TYPE Information Analyses (070) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Affective Measures; Clinical Psychology; Cognitive Tests; History; *Personality Measures; Test Construction; *Test Use
IDENTIFIERS Adult Personality Inventory; Clinical Analysis Questionnaire; *Sixteen Personality Factor Questionnaire

ABSTRACT

The 16 Personality Factor Questionnaire (16PF), which is reviewed historically in this essay, represents a unique and significant chapter in the history of personality assessment. During the first 20 years of its existence, the 16PF underwent numerous revisions and restandardizations. During that period, R. B. Cattell, the creator of the 16PF, laid the foundations for an approach that would uniquely characterize his approach to personality assessment. The 16PF became the parent of an entire family of tests, including shorter versions, single-purpose instruments, and age-specific instruments. At the present time, the system consists of 13 different self-report instruments that encompass 23 different test forms and a total pool of nearly 3,000 items. During its second 20 years of existence, 16PF development has slowed, but use of the instrument has increased. Two notable developments are the Clinical Analysis Questionnaire (CAQ) and the Adult Personality Inventory (API). For the future, it seems that the 16PF tradition will most likely be reflected in the CAQ and API. The former significantly broadened the range of application of the 16PF by adding scales to assess affective and cognitive disturbances. The API anticipated the enormous growth of computerized testing. A 46-item list of references is included. (TJH)

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THE 16PF TRADITION IN CONTEMPORARY PERSONALITY ASSESSMENT

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THE 16PF TRADITION IN CONTEMPORARY PERSONALITY ASSESSMENT[1]

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Twenty four score and seven months ago Raymond Cattell brought forth on this continent, a new personality test, conceived in Factor Analysis, and dedicated to the proposition that all traits are NOT created equal.

With apologies to Lincoln, I begin with this adaptation of an historically significant quotation because I believe that the 16 Personality Factor Questionnaire (16PF) represents a unique and significant chapter in the history of personality assessment. Most tests were designed to measure human characteristics that had immediate, practical significance. In Woodworth's *Personal Data Sheet* (1917), for example, the emphasis was on *assessing* emotional instability, not understanding its causes or components. Hathaway and McKinley sought in the MMPI an objective method for differentiating among known diagnostic categories. The 16PF, on the other hand, was constructed by Cattell simply to measure "personality." His approach was first to discover the naturally occurring structure of personality and then to measure what he discovered. It was only later that he turned to study the relevance of his scales to important social criteria.

Cattell retired from active involvement with the 16PF nearly two decades ago to pursue the theoretical integration of his extensive research (Cattell, 1979; 1980; 1982; 1983; 1987). However, he left a legacy and tradition that is still evolving today, a tradition that is rich in empirical data and psychometric sophistication.

THE FIRST TWENTY YEARS

During the first two decades of its existence, the 16PF underwent numerous revisions and restandardizations. In 1952, all items were changed from a second person format (i.e., "Do you usually tend to do your planning, alone, without suggestions from, and discussions with, other people?") to a first person format (i.e., "I like quiet vacations, away from people"). The 1956, 1962, and 1968 revisions replaced outdated items with new ones. Partly as a function of item replacements, some redefinition of the scales took place after 1949. Since 1956, however, the factors have retained their current, basic meaning.

During this same 20-year period, Cattell lay the foundations for an approach that would uniquely characterize his approach to personality assessment: the 16PF became the parent of an entire family of tests. For example, at the urging of colleagues in industry he worked with them to develop a short version (Form C) which included a "motivational distortion" scale. Both features better adapted the 16PF to the needs of personnel selection and industrial psychologists. At the same time, short, single purpose tests were developed to assess such things as a prospective employee's suitability for jobs

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[1] Paper presented as part of a symposium entitled "Personality Assessment in Counseling Psychology: Contemporary Developments and Advances" at the 97th Annual Convention of the American Psychological Association, August 11, 1989, New Orleans, Louisiana.

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that called for high levels of extroversion (the Contact Personality Factor Questionnaire) or resilience to stress (the Neurotic Personality Factor Questionnaire).

New instruments were constructed to accomodate other age ranges, such as the High School Personality Questionnaire (Cattell, Cattell, & Johns, 1984) for teen-agers, the Children's Personality Questionnaire (Porter & Cattell, 1975) for pre-teens, and the Early School Personality Questionnaire (Coan & Cattell, 1976) for children six to eight years of age.

In this way the 16PF became more a system of personality assessment than a single instrument. While the 16PF is widely used in its own right, the entire system represents an important assessment tradition that evolved over time to meet new needs. At the present time, the total system consists of 13 different self-report instruments that encompass 23 different test forms and a total pool of nearly 3000 items.

THE SECOND TWENTY YEARS

How has this tradition fared in the 20 years since Cattell retired from active involvement with the 16PF? With two notable exceptions that I will address shortly, the revisions, restandardizations, and adaptations that characterized the first 20 years' activities largely stopped. Except for some minor word changes in 1975, the 16PF itself has remained essentially unchanged since the late 1960s.

Despite the slowdown in developmental activities, use of the 16PF by practitioners increased substantially during this period. This was due principally to the publication of two major interpretive guides: Karson and O'Dell's 1976 *Guide to the Clinical Use of the 16PF* and Krug's 1981 *Interpreting 16PF Profile Patterns*. I expect that this trend will continue with the publication only a few week's ago of Heather Birkett Cattell's (1981) important new book, *The 16PF: Personality in depth*.

Although 16PF-related test development research by Cattell and his colleagues largely stopped in 1970, 16PF research by others has continued. In fact, more than half of the test's nearly 3000 published research references have appeared since 1970. There is too much literature to attempt any kind of reasonable summary here. For this interested parties must be referred elsewhere (Cattell, Tatsuoka, & Eber, 1970; Hussong, Sherman, & Ferris, 1976; IPAT Staff, 1986; Krug, 1986a; Krug & Johns, 1990).

However, it is possible to give some sense of the scope of this research by noting the areas covered. For example, within the domain of industrial and organizational psychology, recent research has identified 16PF correlates of occupational preference, job performance, worker satisfaction, absenteeism, tenure, safety, and job performance. Within the clinical area a great deal of attention has been devoted to substance abuse and its treatment and the topic of family violence. The literature relating 16PF scales to physical health is substantial (Krug, 1977). Although recent research in this area is highly diffuse, much of it has concentrated on cardiovascular disease and stress (e.g., Duckitt & Broll, 1983; Krug & Johns, 1986; Lawrence, 1984).

CONTEMPORARY DEVELOPMENTS IN THE 16PF TRADITION

Earlier I noted that with two important exceptions, test development activity in the 16PF tradition was largely complete by 1970. Let me now briefly describe those two exceptions.

The Clinical Analysis Questionnaire

Although many clinicians use the 16PF in their everyday assessments, by itself the test is weak in assessing major affective and cognitive disorders. Experienced interpreters of the profile (e.g., Karson & O'Dell, 1976) have identified certain score patterns suggestive of depression. However, such a diagnosis from the 16PF alone is usually difficult or impossible to make for the vast majority of test users. For that reason, Cattell and his colleagues added a set of scales to measure factorially distinct aspects of depression and cognitive disturbance to the basic 16PF profile to create the Clinical Analysis Questionnaire (CAQ; Krug, 1980).

Since its publication in 1971, the CAQ has become an increasingly important tool in clinical evaluation and treatment planning. The CAQ includes scales to assess relatively stable and enduring personality characteristics originally included in the 16PF profile as well as various aspects of cognitive and affective functioning, such as Suicidal Depression, Agitation, Paranoia, Schizophrenia, and Psychasthenia. Consequently, the CAQ provides a basis for diagnosing specific disorders and describing related personality features simultaneously.

Psychometrically, the CAQ has a number of positive characteristics, such as nonoverlapping scoring keys that maintain independence among the 28 primary scales. Nevertheless, CAQ scale reliabilities appear to be as high or higher than those reported for many other instruments whose longer scales are largely a function of item redundancy (Krug, 1980).

One problem that appears to have limited the CAQ's usefulness in clinical practice is the normative approach taken by Cattell. In order to maintain continuity with other tests in his system, he initially chose to represent CAQ standard scores as normalized *stens*. In this system raw scores are normalized and then transformed to a 10-point scale. Sten scores define 5.5 as the mean in the reference population and bring all distributions to a standard deviation of 2. In theory there is no upper or lower limit to the sten scale. In practice, however, scores are limited to the 1-10 range. That is, standard scores that would fall above 10 are represented as 10; standard scores that would fall below 1 are represented as 1.

With Cattell's other tests this had proven to be a practical format. In the case of the CAQ, however, the limitations imposed by a 10-point, normalized scale appear to be too restrictive for an instrument designed to differentiate among various clinical syndromes. Given the low incidence of many clinical disorders (American Psychiatric Association, 1980), a scale that represents the top 2 1/2% of a score distribution by a single point may be too coarse to use effectively in differential diagnosis. For example, had the MMPI authors chosen to use the same scaling model, about 60% of a sample of depressed cases they tested during the construction of Scale 2 would have been described by a single point (10) on that scale (Hathaway & McKinley, 1956).

Considering arguments offered in support of linear transformation tables for the MMPI, Krug (1989a) recently developed linear *T* score norms for the CAQ. These reasons include: 1) insufficient evidence to indicate the normal curve is an appropriate model for scales designed to measure psychopathological constructs (Hsu, 1984) and 2) a tendency of normalized standard scores to reduce scale elevations systematically (Hsu and Betman, 1986).

It is still too early to know what impact these new tables will have on the utility of the CAQ. Results of Monte Carlo studies that compare the existing tables with the

newer linear conversion tables show that the former produce means that are approximately one tenth of a standard deviation lower than those obtained from the linear conversion tables. In some cases the discrepancies are more than two tenths of a standard deviation. The standard deviations are similarly affected. Scores obtained by use of the normalized tables have a standard deviation approximately 15% less than the original raw scores. As statistics texts show, restriction in a score range often attenuates correlation coefficients (see, for example, Guilford, 1965, p. 343). Researchers who use the existing tables could see validity coefficients of .55, for example, shrink to .50 simply as a result of the raw score to standard score conversion process. The newer tables simultaneously provide practitioners with a more differentiated standard score profile. Consequently, their use may provide greater refinement in the analysis of clinical symptomology and improve diagnostic accuracy.

The Adult Personality Inventory

The second recent development in the 16PF assessment tradition is the appearance of the Adult Personality Inventory (API: Krug, 1984), which reviewers have described as a modern version of the 16PF (Bolton, 1985; Hilgert, 1987; Meier, 1986).

The test itself consists of 324 items that were written to measure the same dimensions assessed by Cattell in the 16PF. Item selection began by factor analyzing the current 16PF item pool. Items that were found to have the strongest loadings on the first principal axis factor within each set were assumed to describe content most central to the definition of each scale.

On the basis of these results new items were written. The primary criteria for item construction were as follows: 1) item content was based on what had been empirically shown to be the strongest themes in each factor item pool; 2) items were to be specific and unambiguous; 3) items were kept as short as possible in order to increase the number of items in the final form and, consequently, the reliability of the test, without increasing testing time.

In addition, a standardized set of response options was introduced ("Generally True," "Uncertain," "Generally False"). Items for Factor B (Intelligence) were separated from the personality items rather than being interspersed as they are in the 16PF. The total number of such items was significantly increased to 30, with 10 sampled from each of the following three domains: verbal ability, numeric ability, and verbal reasoning. In contrast with the existing 16PF, non-overlapping keys were developed for the Faking Good and Faking Bad scales, which were renamed Good Impression and Bad Impression. An Infrequency scale was also developed by keying responses which very few people endorsed under normal testing conditions.

In one rather significant departure from the existing 16PF, the "uncertain" response option was no longer used in the calculation of substantive scores. Empirical research had shown that endorsement of this category appeared to increase the reliability and validity of clinical test scales. But, it appeared to have an undesirable effect on the psychometric characteristics of scales designed to measure normal-range personality characteristics (McFadden & Krug, 1984). In the API these "uncertain" responses were aggregated into a single validity scale and not allowed to contaminate the substantive scores.

The most dramatic departure from the existing 16PF was in the design of the test profile. Although the API is scored for the same elementary scales as the 16PF, these are transformed to a new set of scores in the final API test profile. As a result, the API

profile consists of a set of seven personal characteristic scales that represent major second-order factors among the 16PF primaries, eight interpersonal styles, and six career preference factors. The reason for this was to attempt to organize the information along lines that related more directly to user concerns and presenting questions.

In some ways this development parallels those with respect to the Strong-Campbell Interest Inventory. When it first appeared as the Strong Vocational Interest Blank, the test consisted only of a set of empirically constructed occupational scales. Much later, Clark's (1961) rationale for content homogeneous scales led to the development of a set of 22 "basic interest" scales (Campbell, 1969). Still later, the profile was further expanded by the inclusion of a set of six theory-based general "occupational theme" scales (Campbell & Holland, 1972).

In a further attempt to make the API even more considerate of user needs, a microcomputer software system was developed that administers, scores, and generates narrative reports of test results automatically. The system also incorporates a unique feature called "decision modeling" that helps the test user focus and plan testing objectives prior to the actual assessment (Krug, 1985).

Because there were so many changes and improvements, the name of the test was finally changed to the API in order to avoid confusion with earlier versions of the 16PF. But, even more than other tests in the 16PF system, the API retains precise links with the original 16PF and the underlying personality model on which the 16PF is based. During its standardization, for example, API scales were linearly equated to corresponding 16PF scales.

EVALUATION AND FUTURE DIRECTIONS

What can be said about the future of an assessment tradition that began nearly a half century ago? In some ways, much of the future of the 16PF has already been written, in no small part due to the extraordinary vision and effort of its principal author. In the two decades he actively worked with the 16PF, it underwent continual development and restandardization.

During this same period Cattell created the first of the derivative instruments which uniquely characterized his systems approach to personality assessment. That is, he did not attempt to accommodate all contingencies simply by stretching the existing item pool. Instead he used the 16PF as a starting point for new instruments that were individually tailored to particular testing needs. This approach involved greater effort and investment. Each new instrument required independent validation and standardization. But the plan appears to have been responsive to the needs of test users and researchers.

Given the growth patterns evident in psychological testing and Cattell's withdrawal from test development activity in 1973, it seems probable that the future of the 16PF tradition will most likely to be reflected in two of its "offspring," the CAQ and the API, that I described earlier. The former significantly broadened the range of application of the 16PF by adding scales to assess affective and cognitive disturbances, two areas of personality assessment in which the older 16PF was deficient. The API, on the other hand, anticipated the enormous growth of computerized testing (Krug, 1984b; 1987a; 1987b; 1988; 1990) and the need for instruments compatible with this new technology. Its short items, simplified format, and decision model feature make it especially adapted to the new era of "solid state psychology" (Krug 1986b; 1987a; 1988; 1989b; 1990).

Perhaps the greatest strength of this tradition lies in the multivariate personality model that underlies the tests and, indeed, all of Cattell's work. Items have been selected primarily on the basis of their relationship to a set of unchanging theoretical constructs, which have been successively refined in a series of empirical studies carried out over three decades (Cattell & Krug, 1986). Consequently, it has been possible to update, improve, and transform the test several times in response to changing needs, populations, and assessment goals.

And so, for a variety of reasons, after 40 years, the 16PF tradition is very much alive and well today and living in 13 different instruments.

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